Foodborne disease: how to respond?

Epidemiological, as well as microbiological, investigation is vital

In 1982, the first outbreaks of haemorrhagic colitis caused by *Escherichia coli* O157:H7 were reported, in the United States.[1] Since then, outbreaks of diarrhoeal illness and haemolytic–uraemic syndrome (HUS) caused by enterohaemorrhagic *E. coli* have been recognised worldwide.[2] The recent massive outbreaks of *E. coli* O157:H7 infections and HUS in Japan offer dramatic evidence of the potential impact of these pathogens, and highlight the importance of appropriate surveillance and investigations for foodborne disease.

The epidemiology of foodborne disease has changed with the increased consumption of raw or minimally processed foods, consumption of foods outside the home, and mass production and distribution of ready-to-eat foods. These trends are apparent throughout the developed world.[3] It is in the context of these changes in diet and the food industry that "new" pathogens such as *E. coli* O157:H7 have emerged, and will continue to emerge.[4] Although Australia is a net exporter of food, it cannot be isolated from the international movement of foodborne pathogens, carried by live animals, meat, seeds, fresh produce and people. For example, contaminated alfalfa sprouts distributed from the Netherlands caused outbreaks of *Salmonella* serovar *stanley* infections in Finland and the United States,[5] and raspberries from Guatemala caused a series of outbreaks of *Cyclospora* infection in North America.[6]

Responding to the threat of these emerging diseases requires a commitment to public health surveillance of foodborne disease, incorporating epidemiological methods (such as case–control studies to determine risk factors for the disease, and studies of temporal and geographic disease distributions), with close collaboration between acute-disease epidemiologists and public health laboratories. Surveillance of foodborne disease should include:

- Prompt, thorough epidemiological investigation of outbreaks associated with events or establishments, to identify the agent and the source — this may be the only way to identify "new" foodborne pathogens, such as *E. coli* O157:H7 or *Cyclospora* spp.
- Pathogen-specific surveillance to identify clusters of cases caused by the same organism, followed by epidemiological investigation of cases to identify the source. Molecular subtyping schemes (e.g., by gel electrophoresis) can greatly improve identification of clusters of the same organism, such as a particular *Salmonella* serovar (e.g., *Salmonella typhimurium*).
- Determination of risk factors for sporadic cases of infection with common foodborne pathogens — this can help to identify targets for intervention and provide a basis to evaluate its effectiveness.

An example from the United States highlights the importance of epidemiological methods. In 1994, a nationwide outbreak of *Salmonella enteritidis* infections was associated with commercially manufactured ice cream.[7] Results of an epidemiological case–control study in Minnesota allowed nationwide recall of the contaminated ice cream 10 days before *S. enteritidis* was isolated from official samples of the ice cream. This may have prevented many additional cases.

In contrast, investigating the source of a recent large outbreak of *E. coli* O157:H7 infection among schoolchildren in Japan relied exclusively on microbiological culture of available food items served to the children. The failure to isolate *E. coli* O157:H7 from any of these foods, and lack of any epidemiological data on the association between food consumption and illness, has left officials ignorant of both the source and how to prevent another outbreak.

While such massive outbreaks of *E. coli* O157:H7 infection are unlikely in Australia, the US or other countries where public health responses incorporate both epidemiological and microbiological investigations, more can be done to enhance our surveillance of foodborne disease. Public health microbiology laboratories need resources to maintain state-of-the-art performance (such as pulsed-field gel electrophoresis to identify organism subtypes, and polymerase chain reaction to detect pathogens or virulence factors). Epidemiological resources (including sufficient numbers of appropriately trained staff) are needed to fully use the expanded laboratory capability.

In addition, implementing epidemiological methods of foodborne disease surveillance requires the active participation of health care providers. Because clinical presentation is similar for many foodborne diseases, identification of the organism by culture is necessary to confirm diagnosis. Although this may not benefit the patient directly, it may benefit the community by detecting a foodborne outbreak. In an era of emerging diseases, maintaining the safety of our food supply depends on effective surveillance of foodborne disease.[4]

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